# Consolidated Questions and Responses from the **Environmental Stakeholder Roundtable on Wind Power** held June 16, 2009

NYSERDA held a workshop on June 16, 2009 to provide a forum to address as many questions as possible regarding large-scale wind power projects in operation of planned for New York State.

NYSERDA asked for questions to be submitted prior to the meeting to provide the opportunity for panel members to organize their remarks and to, hopefully, be as efficient as possible in providing comments. The following questions are a synthesis of the ones received. To the extent possible, reference is made to external resources that can be used by the reader to more fully explore the question topic.

### **Technology and Power Markets**

#### **Technology**

What are the Capacity Values of wind projects are in NYS?

Refer to the Wind Energy ToolKit:

Capacity factor is discussed in Chapter 5: While wind turbines tend to be highly reliable, a wind power plant will have decreases in output due to seasonal and daily variations in the wind resource. Due to this variation, wind power plants may have a capacity factor of 30%-40%. This represents the ratio of the actual production of the wind farm to the project's rated capacity. The capacity factor will vary depending on the time of year. These variations can be quantified and reasonably predicted based on the seasonal and daily patterns of wind speeds (p.17).

How many industrial wind turbines, scattered over how large an area, would it take to collectively deliver a Capacity Value equivalent to a 1 GW conventional (e.g. nuclear) generating system?

Refer to the Wind Energy ToolKit:

A range of average capacity factors is provided in Chapter 5 and the FAQs, and a typical land area per WTG, so it could be estimated based on that information. The average typical land use per wind turbine generator is 1 acre. This includes the lands required for roads, pad, turbine, and necessary rights of way. This is the same average land use per turbine as a gas or oil pump. It could be noted that some farmers in NYS have reported that they actually gained farm land, as the new roads constructed for the wind facility allowed them to access land they could previously not access with heavy machinery. There is also the need to space the turbines to allow for uninterrupted wind flow. While very site dependent, on average could be between 25-30 acres.

## What is the risk of harmonic power distortion caused by industrial wind turbines, and how can it be managed?

Typical rotating generators emit only low order harmonics, which are typical, and will not affect power quality on the grid. If a power converter is used for grid interconnection, there are chances of larger harmonics being emitted. Thus, wind turbines that utilize power converters for grid connection are required to be tested and meet the International Electrotechnical Commission (IEC) standard IEC 61400-21. (SOURCE: Ackermann, Thomas, ed. Wind Power in Power Systems. West Sussex, England: John Wiley & Sons, Ltd, 2005)

## How much electricity is consumed by wind turbines: e.g. to heat or cool generators, to heat (de-ice) turbine blades, to initiate blade rotation, to run operating lights, etc.?

Specific technical information about wind turbines, such as component power consumption, is often regarded as proprietary by the turbine manufacturer and is therefore not publically available. In general, the turbine's power curve takes into account all of the energy consumed by the turbine during operation, with the exception of a climate adaptation package (additional heating or cooling systems). The amount of energy consumed varies between wind turbine models and will be dependent upon the site's ambient conditions. The capacity factor of the turbine takes into account parasitic losses. Typically, the amount of energy consumed by climate adaptation packages is minimal compared to the amount of energy produced.

## What is the average amount of concrete in the base of the largest size industrial wind turbines used in NYS?

The volume of concrete used in the base of the turbine is determined by a variety of factors. An article the discusses foundation design is at the following site:

http://www.garradhassan.com/downloads/reports/Wind\_Turbine\_Foundation\_Behavior\_and\_ Design Considerations.pdf

## How much CO2 is saved per MWH of operation of wind projects in NYS? Please identify all assumptions made and use only actual data.

Refer to the attachment: Thomas Bourgeois\_Wind\_presentation\_MG15\_TOP\_18JUN2009.pdf for the presentation on this topic from the workshop.

#### Transmission/Reliability

## If a wind project is built but there isn't enough transmission availability, then what happens to its electricity and what are the costs to the citizens of NYS?

When the grid cannot accommodate additional power, the wind facilities are asked to curtail to an output level that is adequate for the grid. This means that the wind facility will decrease production to the level established by the NYISO. The loss in revenue from the curtailment will

be shouldered by the project owner, not the rate payers and the facility will only receive the PTC for the power that is generated and placed onto the grid. Given the low cost of wind energy, curtailment often results in higher energy prices for the consumer. It could be noted that renewable energy credits are not earned for electricity not making it onto the grid.

Is the relationship of wind penetration to whether or not there is a burden on the grid a threshold phenomenon or a power factor relationship? Is there any research on the diminishing (beneficial) returns of increasing levels of wind?

The power factor is related to the reactive power that is allowed on the grid. Wind turbines have a variable power factor. This means that they are capable of creating and consuming reactive power on the grid, which increases the stability of the electric power system. The increase of wind penetration on the grid requires more power to be pushed through transmission lines to load centers. The increase in power flow on the lines is meeting or exceeding the thermal ratings of the lines and causing thermal overloads within the system.

Multiple independent studies related to penetration of intermittent sources and grid reliability can be found at http://www.uwig.org/opimpactsdocs.html. This is the site of the Utility Wind Integration Group. Papers can also be found at NREL.

How many miles of wind energy necessitated transmission lines are there in NYS, what is their cost, and who is paying for them?

The only transmission lines made necessary by wind power in New York to date are those associated with connecting the project to the bulk power supply grid.. Such transmission lines are built and financed by the project developer. This includes both transmission to the closest feasible point of interconnection (POI) and the necessary upgrades to the existing transmission infrastructure to place the facility online. The transmission to POI is paid for by the developer. The costs of necessary upgrades are allocated to the developers of all generation facilities that require the upgrade for interconnection.

#### Incentives/RPS

Why aren't all incentives, subsidies and rate guarantees available for wind developers tied to actual measured reductions in CO2 directly attributable to their project?

The payments to generation projects supported in the RPS are based on the MWH of production sold into the New York State power market. The RPS values renewable fueled resources for their contribution to energy security, diversity, economic benefits and displacement of conventional power generation that is less environmentally beneficial. This displacement also results in suppression of wholesale power costs. The ability to set regional carbon emissions caps or limits in the northeast under the current greenhouse gas initiative is in part attributable to mandates for increasing penetration of renewable energy by the participating state policies.

## At what point will wind power developments stop getting such generous incentives, subsidies and guarantees?

Incentives are provided to wind projects based on the results from a series of competitive Requests for Proposals. NYSERDA administers the RPS program on behalf of the NYS Public Service Commission. As the environmental costs associated with the operation of conventional generation (e.g., coal and oil) become recognized and monetized in the existing power markets, the costs of conventional generation will increase as will the price paid to all power generators. Renewable sources of power will begin receiving higher revenues from the power markets to reflect this environmental reality. More efficient pricing of the true environmental costs of conventional generation in New York and nationally will allow RPS subsidies across the country to diminish if not cease entirely over time.

As outlined in greater detail in the draft State Energy Plan<sup>1</sup>, renewable electricity resources reduce the net retail price of electricity paid by all ratepayers. In 2018, the average statewide retail price of electricity is projected to be 0.06 to 0.16 cents per kWh lower than it would otherwise be without the implementation of RPS-supported renewable resources, representing an **annual bill savings** to ratepayers of \$93 to \$262 million.<sup>2</sup> The estimated net retail price impact includes a reduction in the wholesale commodity price of electricity of 0.26 cents per kWh, netted against the estimated retail price increase of 0.1 to 0.2 cents per kWh, due to the collection of ratepayer funds to pay the price premium for the purchase of renewable energy under the RPS and —"backing out" of the more expensive, less efficient fossil fuel-fired units.

What are the costs to NYS ratepayers when estimated future performance of wind energy is not met? NYSERDA's reliance on a 20%± Capacity Credit for wind (which assumes accurate forecasting techniques) would have significant implications for increasing the use of "Spot Market Generation" if that 20% figure proved too optimistic. This cost would be passed on to NYS ratepayers.

New York State ratepayers contribute to the RPS. As the program is currently designed, NYSERDA is the central administrator of the RPS. NYSERDA competitively selects projects for funding in the Main Tier (wholesale power production). A copy of the most recent competitive solicitation can be viewed at <a href="http://www.nyserda.org/funding/1681summary.pdf">http://www.nyserda.org/funding/1681summary.pdf</a>. Following the selection procedures in the solicitation, NYSERDA will contract with companies for the purchase of RPS Attributes. NYSERDA only pays for RPS Attributes based on the electric power delivery requirements outlined in the solicitation.

<sup>&</sup>lt;sup>1</sup> Renewable Energy Assessment New York State Energy Plan 2009 August 2009; http://www.nysenergyplan.com/Assessments/Renewable%20Energy%20Assessment.pdf;

<sup>&</sup>lt;sup>2</sup> 7 The model inputs were designed to reflect the '45 by 15' clean energy goal, which calls for 30 percent of electricity generation from renewable, and a post-Energy Efficiency Portfolio Standard (post-EEPS) load forecast RPS program target (10,123,157 MWh).

Less than expected performance would result in the use of other conventional forms of energy in the affected hours. However, unless consumers are able to reduce their energy consumption, they would have to pay either renewable generator (operating at expected capabilities) or conventional generators (should renewable generators not meet expectations on operation).

Variability in wind capacity and energy is much like variability in energy requirements...both must be predicted and planned for. Studies in New York indicate that the costs of integrating as much as 3,000 MW of wind can be reasonably accommodated without imposing significant costs on consumers. NYSERDA and the NYISO jointly prepared this assessment; refer to <a href="http://www.nyserda.org/rps/documents.asp">http://www.nyserda.org/rps/documents.asp</a>

How are payments made to wind projects in the RPS? Does NYSERDA payout RPS funds to wind farms based on wind-industry reported capacities or are payments based only on actual electricity produced and sold to the NYISO grid in MWHs?

Projects under contract to NYSERDA under the Renewable Portfolio Standard program are paid based on the contract rate per MWH after they meet the delivery requirements of their contract. Delivery is verified through data provided by the NYISO. NYSERDA only pays for the MWH generated and delivered to the New York electric system.

Is NYSERDA paying any RPS money to out-of-state wind projects? If yes, please provide full details.

Documents are available at <a href="http://www.nyserda.org/rps/index.asp">http://www.nyserda.org/rps/index.asp</a> that describe the process used in selecting projects under the RPS and copies of previous competitive solicitations. There have been projects selected for funding that are located outside of New York State.

NYSERDA periodically publishes status reports for the RPS program. These are available on line at: http://www.nyserda.org/rps/documents.asp

#### Power Market/RECs

Exactly how are "Credits" calculated for wind energy projects? These come into play for Cap & Trade type schemes. The question is how are the number of Credits determined the amount a particular NYS wind development "earns" in credits that they can then resell.

NYSERDA acquires the rights to RPS Attributes from a generation facility on a MWH basis. In markets that have Renewable Energy Credit systems in place, there is one Renewable Energy Credit for each MWH of power generated. NYSERDA uses a competitive solicitation process to select projects for RPS contracts. As the solicitation is currently designed, in addition to consideration for direct economic benefits to New York, the program selects eligible projects that are requesting the least amount for a RPS Attribute. A copy of the most recent solicitation can be found at http://www.nyserda.org/funding/1681summary.pdf.

Has any NYS generated wind electricity been sold to other states?

The NYSERDA RPS program does not have the rights to environmental attributes from all of the wind projects operating in New York. It is likely that wind power has been sold into the Massachusetts RPS market.

Does NYSERDA allow wind farms in NY State to issue Renewable Energy Certificates (RECs) based on wind electricity multi-year contracts they have with a corporate customer for wind electricity that has not yet been generated nor delivered to that corporate customer?

NYSERDA does not issue Renewable Energy Certificates. For wind projects NYSERDA has under contract, payment is made on a per MWH generated basis. NYSERDA does not have/would not have, any information on any contract between a wind generator and a customer. Such information is typically held in confidence.

Please breakdown exactly where every REC dollar bought in NYS goes (e.g. what % to wind developers, NYSERDA, marketing, brokerage, etc.)

NYSERDA periodically publishes status reports for the RPS program where such data resides. These are available on line at: <a href="http://www.nyserda.org/rps/documents.asp">http://www.nyserda.org/rps/documents.asp</a>

Are there any NYS wholesale markets that have energy/capacity market contracts that are indexed to (or otherwise tied to) fossil fuel prices?

It is expected that there are contracts between buyers and sellers of electric power. The terms of these arrangements would be subject to private negotiation among the parties.

#### **Economics**

As a corollary to one of the environmental questions, what is the full cost per ton of CO2 saved by wind energy in NYS?

The draft State Energy Plan Issue Brief on Climate Change contains some information to address this topic (http://www.nysenergyplan.com/stateenergyplan.html).

In addition, The National Academies of Science published a report on October 9, 2009 on the *Hidden Costs of Energy Unpriced Consequences of Energy Production and Use*. A summary of the report is available at http://dels.nas.edu/dels/rpt\_briefs/hidden\_costs\_of\_energy\_Final.pdf

#### **Environmental Discussion**

#### **Impacts**

What research is active in New York, and elsewhere, on the possible health effects of industrial wind turbines on its citizens and wildlife?

Refer to the attachment: Jim Newman\_Comparative Wildlife Effects Presentation\_6-16-09.pdf for a discussion of this topic that was presented at the Workshop. NYSERDA, in conjunction with NYSDEC, has also been supporting a series of projects at the Maple Ridge Wind Farm to evaluate the impact of wind on wildlife.

#### Has there been any research on the role of set-backs in mitigating possible health impacts of turbines?

NYSERDA has not supported research in the role of set-backs. Set-back requirements have been used to minimize safety concerns in the event of a turbine collapse. NYSERDA is currently developing a competitive solicitation to explore potential noise issues related to wind development.

#### SEQRA/Environmental Reviews

#### Outline the SEQRA process and the roles of all participants?

Refer to the Wind Energy ToolKit for a discussion of the State Environmental Quality Review Act (SEQRA) requirements. In addition, material on his topic was presented at the Roundtable and is contained in DEC ROLE IN WIND PROJECT REVIEW NYSERDA Env Symposium.pdf

#### Where does the discussion of turbine set-backs come up in the siting process for wind projects?

The discussion of set-backs would typically be discussed during the environmental review process for the project.

## How is the net environmental contribution of an alternative energy source that has known (as well as several potential) negative environmental effects determined?

For a specific project, the environmental review of the project under SEQRA would include a discussion of alternatives approaches.

#### Noise

### What research has justified the choice of 50 dBA as an appropriate noise criteria, particularly for rural areas of the state?

Refer to attachment: Daniel A. Driscoll\_Wind Roundtable Presentation w Figs.pdf from one of the presentations on this topic from the Roundtable. NYSERDA is currently developing a competitive solicitation to explore potential noise issues related to wind development.

Have studies been done in New York that identify the low frequency sounds (infra sound) from wind turbines, and their effects on humans and animals?

NYSERDA has not supported this type of research in the past. As discussed at the Roundtable, the NYS Department of Health is developing programs to evaluate noise.

### **Local Decision Making Panel**

There were a number of questions in the area of local decision making and landowner rights. Interested parties might want to visit: <a href="http://www.governmentlaw.org/landuse.php">http://www.governmentlaw.org/landuse.php</a>. This is an on-line resource of the Albany Law School. There are reports and information on a broad range of topics including some specifically on issues involving wind power and New York State.

Are farmers renting some of their land to a for-profit business entitled to an agricultural property tax exemption for that portion of their property?

The section of the Agricultural Districts Law that may address this question:

AML 305(1)(d)(iv): If such land or any portion thereof is converted to a use other than for agricultural production by virtue of oil, gas or wind exploration, development, or extraction activity or by virtue of a taking by eminent domain or other involuntary proceeding other than a tax sale, the land or portion so converted shall not be subject to payments. If the land so converted constitutes only a portion of a parcel described on the assessment roll, the assessor shall apportion the assessment, and adjust the agricultural assessment attributable to the portion of the parcel not subject to such conversion by subtracting the proportionate part of the agricultural assessment attributable to the portion so converted. Provided further that land within an agricultural district and eligible for an agricultural assessment shall not be considered to have been converted to a use other than for agricultural production solely due to the conveyance of oil, gas or wind rights associated with that land.

This just means that if land is used for agricultural purposes, subject to an agricultural assessment, and the land is converted to oil/gas/wind use, the landowner does not have to pay a conversion fee or back taxes on the property.

### **General Questions: New York State Energy Planning Process**

### What does NYSERDA see as the future potential of geothermal-electric?

NYSERDA has supported research programs in geothermal-electric and anticipates additional efforts in the future.

### What are NYSERDA's plans for efficiency improvements of the electric delivery grid?

NYSERDA has established a research program focused on electric transmission and distribution.

In addition, NYSERDA is involved with the NYS Smart Grid Consortium (<a href="http://nyssmartgrid.com">http://nyssmartgrid.com</a>). The Consortium represents a comprehensive, coordinated and collaborative approach to implement an efficient, effective, and secure electric power supply and delivery system that meets the energy needs of all customers in the state. New York has three primary energy policy goals — sustainability, reliability and affordability. The state has a unique wealth of intellectual, industrial and institutional resources focused on the development of the smart grid. The Consortium was formed in 2008 and is the only organization of its scale in the U.S. that is committed to representing all major contributors across the energy value chain from utilities, markets, operators, industry, academia, government and end-users.

Does NYSERDA have any independent studies that assess at what point the diversity of the grid begins to diminish its reliability? An argument that politicians make for adding wind power is to increase supply "diversity." Since NYS already has hydro (large and small), gas (several types and sizes), nuclear, coal, oil, and biomass, how many more are needed before diversification is satisfied?

NYSERDA and the NYISO supported a research project available at the following site that explored the impact of adding large amounts on wind to the electric grid in New York State. <a href="http://www.nyserda.org/rps/documents.asp">http://www.nyserda.org/rps/documents.asp</a>

#### Does NYSERDA has a program in nuclear energy?

NYSERDA does not have a research program in the area of nuclear energy generation. NYSERDA does operate the Western New York Nuclear Service Center established in the 1960s in response to a federal call for efforts to commercialize the reprocessing of spent nuclear fuel from power reactors. Information on the West Valley program can be found at: http://www.nyserda.org/programs/West Valley/default.asp

How is nuclear energy being considered in New York? What are NYSERDA's efforts in regard to educating the politicians that nuclear should be considered a renewable in the RPS?

The New York State Energy Plan is available at the following site: http://www.nysenergyplan.com/

#### **Additional Sources of Information:**

National Renewable Energy Laboratory (NREL)

Multiple reports and presentations pertaining to wind systems integration are available at <a href="http://www.nrel.gov/wind/systemsintegration/publications.html">http://www.nrel.gov/wind/systemsintegration/publications.html</a>.

#### **Utility Wind Interest Group**

The mission of the Utility Wind Integration Group (UWIG) is to accelerate the development and application of good engineering and operational practices supporting the appropriate integration of wind power into the electric system. This will be accomplished through the

coordinated efforts and actions of its members in collaboration with wind industry stakeholders, including federal agencies, trade associations, and industry research organizations.

http://www.uwig.org/

### **NYSERDA - Wind Energy Toolkit**

The Wind energy toolkit at <a href="www.powernaturally.org">www.powernaturally.org</a> is a series of documents that address questions on the siting, construction and operation of wind